Docket Number	CASE 4-20624/A/PCT

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF
ZIMMERMANN ET AL.
APPLICATION NO: 09/051,827
FILED: MAY 1, 1998
FOR: PURINE DERIVATIVES AND PROCESSES FOR THEIR PREPARATION

Art Unit: 1624
Examiner: M. BERCH

Assistant Commissioner for Patents
Washington, D.C. 20231

APPEAL BRIEF

Sir:

This appeal is from the decision of the Primary Examiner dated September 13, 2000 finally rejecting claims 2-4, 6, 14, and 16-19. These Claims, in clean rewritten form, appears in the Appendix.

Appellants respectfully request reconsideration and reversal of the rejection. The Notice of Appeal was received February 15, 2001. The time for filing the brief, with a three-month extension, is July 15, 2001. An appropriate extension of time request for three (3) months, until July 15, 2001, is included in this paper.

Appellants had previously paid for a one-month extension of the brief.

1. Real Party in Interest:

The real party in interest is Novartis AG, Basel Switzerland.

2. Related Appeals and Interferences:

No other appeals or interferences are known which are related to the pending appeal, and further, no other related appeals or interferences are known which will directly affect, be directly affected by or have a bearing on the decision of the pending appeal to the pending appeal.

3. Status of the Claims:

The claims originally filed were Claims 1-16. Claims 17-19 were added. Claim 1 has been cancelled. Claim 15 is allowed. Claims 2-4, 6, 14, and 16-19 are in this Appeal. An amendment after Final rejection under Rule 116 was filed May 15, 2001,concurrently with an earlier version of this brief, for the purpose of providing a clean copy of the claims on appeal, and to rewrite the claims as Claims 20-28, respectively. This amendment was not entered.

Claims 2, 3, 4, 6, 16 and 17 are compound claims, Claims 2 and 16 are independent; Claims 3, 4, 6 and 17 are dependent on Claim 2. Claim 14 is an independent process claim for the preparation of compounds, said compounds having the same scope as in Claim 2. Claims 18 and 19 are composition and method of treatment claims, respectively.

4. Status of the Amendments:

The specification containing 1-16 claims and a preliminary amendment which amended Claims 3, 8, 9, 10, 11, 12 and 13 were filed together on May 1, 1998 as USSN 09/051,827, the application on appeal. A second preliminary amendment was filed November 8, 1999, amending Claims 1, 2, 5, 6, 10, 11, 12, 13, and 14. In response to the first Office Action of March 29, 2000 and a supplemental Office Action of May 2, 2000, Appellants submitted arguments, canceling Claim 1, 5, and 7-13 adding Claims 17-19 and amending Claims 2, 3, 4, 5, 6, 14, 15, and 16, on August 2, 2000. The Final Rejection of September 13, 2000 followed, which remains outstanding. An Amendment after Final Rejection was filed on May 15 2001, concurrently with an earlier version of this brief for the purpose of providing a rewritten clean copy of the claims on appeal. Appellants had provided a rewritten clean copy of the claims to avoid the problems, noted by the Examiner

in the Final Rejection, of the simultaneous deletion brackets and brackets to be printed in the same claim.

The Amendment After Final dated May 15, 2001 was not entered, however, and the brief filed concurrently held to be improper, for the reason that the 116 amendment was not entered, (Office Action paper mailed June 5, 2001) and therefore the brief referred to the wrong numbering of the claims. This brief provides the set of Claims as numbered in the case under Final Rejection and as appealed in the Notice of Appeal. The Appendix provides a clean copy of the claims on appeal. Appellants have revised the brief to refer to the original claim numbering. In addition, Appellants have responded to the modifications of the enablement rejection issues as clarified by the Examiner in the paper mailed June 5 2001, which was in turn a response to Appellants' Amendment After Final filed May 15, 2001.

5. Summary of the Invention:

The invention relates to compounds that are 2-amino-6-anilino purine derivatives, processes for making them, a pharmaceutical composition containing them and a method for the treatment of tumors using the compounds. The tumors susceptible to treatment are those which are responsive to the inhibition of $p34^{cdc2}$/cyclin B^{cdc13} kinase.

6. Issues:

The major outstanding issues to be resolved in this appeal are primarily those of Section 112, 1st and 2nd paragraphs.

The problems raised under the 1st paragraph of Section 112 relate to Claims 2-4, 6, 14, 16-19 (all the claims in the case, excepting Claim 15, which has been allowed). The issue as stated by the Examiner is that the specification, while enabling for most choices, "does not reasonably provide enablement for substituted carbocyclic rings and substituted heterocycles", and therefore does not enable the skilled person in the art to use the invention, Final Rejection dated 9/13/00, p.2, 3rd paragraph.

In the Communication dated June 5, 2001, in which the Examiner responded to the amendment after Final filed May 15, 2001, the Examiner has clarified the issue of enablement, stating that the specification did not "provide enablement for substituted non-

aromatic carbocyclic rings", Communication dated June 5, 2001, p. 5. The Examiner did note that the specification at p. 15 provided support for substituted heterocycles. Therefore, the issue of enablement in this appeal relates to the use of the "substituted non-aromatic carbocyclic rings".

Claims 2, 3, 14, 16, and 18-19 are rejected under Section 112, 1st paragraph, as containing subject matter which was not described in the specification, referring to the use in the definition of "mercapto" rather than the "thio" originally employed.

The Examiner has also rejected Claims 2, 16, and 19 under Section 112, 2nd paragraph, as being indefinite by failing to particularly point out and distinctly claim the subject matter of the invention. The Examiner has questioned the scope of Claim 19, stating that the category of tumors to be treated is not well defined.

Claims 2, 6, 14, 18, and 19 are rejected under 102(a) as anticipated by Mackman, US 5,866,702. Claim 4 is rejected under 103(a) as obvious over Mackman, ibid. The Examiner has explained that these art-based rejections relate to the issue of enablement under 1st paragraph of Section 112, above, and once the issue of enablement is solved, the art based rejection will disappear as well.

7. Grouping of the appealed Claims:

Claims 2-4, 6, 14, 16-17 on the one hand, and Claims 18 and 19 on the other hand, are separately patentable and do not stand or fall together. The compounds and the process for making the compounds are in Claims 2, 3, 4, 6, 14, 16 and 17. The pharmaceutical composition and method of treatment Claims 18 and 19 can be considered separately patentable.

8. Arguments

A. The Law Relating to Enablement under Section 112, first paragraph (the Rejection of Claims 2-4, 6, 14, 16-19)

It is axiomatic that the first paragraph of §112 requires "nothing more than objective enablement". How such a teaching is set forth, either by the use of illustrative examples or by broad terminology, is irrelevant, In re Marzocchi, 169 USPQ 367, 369 (CCPA 1971).

This principal is developed further in the MPEP, Section 2163.02, ". . . the fundamental factual inquiry is whether a claim defines an invention that is clearly conveyed to those skilled in the art at the time the application was filed. The subject matter of the claim need not be described literally (i.e., using the same terms or in haec verba) in order for the disclosure to satisfy the description requirement."

In the instant application on appeal, the Examiner has held that the scope of the claim is not within the broadest genus of the structure of Formula I. He has stated that Appellants do "not reasonably provide enablement for substituted non-aromatic carbocyclic rings", p. 5, paper mailed June 5, 2001.

Appellants respectfully differ with the position taken by the Examiner. In the specification p. 12 and 13, there is ample and adequate support for substituted non-aromatic carbocyclic rings. At page 12 of the specification, last paragraph, "A carbocyclic-aliphatic radical R_4 or R_5 can be substituted both in the carbocyclic and in the aliphatic moiety ", further continuing to list examples of suitable substituents. On the next page of the specification, substituents are defined as being on non-aromatic carbocyclic rings, p. 134, 3rd and 4th paragraphs. "A carbocyclic radical R_4 or R_5 having no more than 29 C atoms is such an unsubstituted or substituted hydrocarbon radical, lines 13-14. See also lines 21-25 at p. 13, "Cycloalkyl represented by the radicals R_4 or R_5 can also be substituted by 1, 2 or more," etc. . . ".

Appellants contend that such support constituents adequate enablement for the use of the term "substituted non-aromatic carbocyclic rings", and that the rejection should not be sustained in this appeal. The specification in fact supports the broad genus of the claims. It is apparent from a reading of the specification that the scope of the claim is clearly within the subject matter of the application.

Another issue in this appeal relates to the inclusion of the term "mercapto", the use of which in Claim 2 had been objected to by the Examiner, Final Rejection, p 3, 2nd full paragraph. The Examiner had said that the specification did not provide support for this term. Appellants respectfully point out that the term "mercapto" is supported by the specification at p. 8, line 13, where specifically in regard to the formula R_7 (R_8) N-, wherein

R_7 and R_8 are defined as including "mercapto". This is exactly the definition that appears in the rejected language that was added to the Claims on appeal. Enablement exists in the specification for use of the term, and is neither new matter nor should it be excluded from the claim language and scope.

Reconsideration of the Examiner's position regarding enablement and reversal of it on appeal is respectfully requested.

B. The Law Relating to Enablement under Section 112, second paragraph (the Rejection of Claims 2, 16-19)

The Examiner has stated that the scope of Claim 19 is unclear, commenting that the category of tumors is not well defined, and that one of ordinary skill in the art is forced to unduly experiment to determine its scope. Appellants respectfully disagree that this position accurately applies to the claims on appeal. Both the specification and claims make it clear that the tumors are those which are responsive to the inhibition of $p34^{cdc2}$/cyclin B^{cdc13} kinase. Appellants have defined the tumors by this property and have provided a teaching of how to identify such tumors, as well as an assay to measure the response of such tumors to treatment, see the specification, page 17, last paragraph, to p. 20, first paragraph. This is sufficient teaching to satisfy the law of enablement.

Recent case law has tended to accept a limitation such as "an effective amount" as being definite when read in light of the supporting disclosure and in the absence of any prior art which would give rise to uncertainty about the scope of the claim. In Ex parte Skuballa, 12 USPQ2d 1570 (Bd. Pat. App. & Inter. 1989), the Board held that a pharmaceutical composition claim which recited an "effective amount of a compound of claim 1" without stating the function to be achieved was definite, particularly when read in light of the supporting disclosure which provided guidelines as to the intended utilities and how the uses could be effected. In the instant appeal, the Claims 2, and 16-19 satisfy the requirements of Section 112, 2nd paragraph. The examiner is incorrect in his rejection and should be overruled.

C. The Rejection under Sections 102/103

Claims 2, 6, 14, 18, and 19 are rejected under 102(a) as anticipated by Mackman, US 5,866,702. Claim 4 is rejected under 103(a) as obvious over Mackman, ibid. This grounds of rejection has been stated by the Examiner as ancillary to the issue of enablement, under Section 112, 1st paragraph. As noted above, Appellants have presented arguments and reasons why the rejection under Section 112 is erroneous, and should be reversed. The Examiner has admitted that this art rejection will be rendered irrelevant if the Section 112 issues are resolved in favor of Appellants. As the relief sought is the reversal of the rejection of the claims under Section 112, the art rejections will be mooted by the grant of such relief.

CONCLUSION

In conclusion, Appellants have provided arguments why the invention being claimed is sufficient under Section 112, both 1st and 2nd paragraphs, and is in compliance with all requirements of that statute. Appellants' analysis demonstrates that the application is sufficient and adequate, and that the Examiner's position is in error. Appellants also have demonstrated that the scope of the claims sought are adequately supported and enabled by the specification. Appellants respectfully request that the outstanding rejection under 35 USC § 112 be withdrawn, and the claims allowed to issue as US Letters Patent.

Appellants respectfully request that the outstanding rejections under 35 USC §§ 112, 102 and 103 be withdrawn, and the claims allowed to issue as US Letters Patent. Reversal of the examiner's decision is sought as relief from the Board of Appeals.

10. REQUEST TO CHARGE DEPOSIT ACCOUNT

In the papers filed with the brief mailed May 15, 2001, which was held improper, there was authorization to charge Appellants' assignee's deposit account. Should an additional fee be necessary, please charge any such fee due for the filing of this brief to Deposit Account No. 19-0134 in the name of Novartis Corporation. The Commissioner is hereby authorized to charge any additional fees under 37 CFR § 1.17, which may be required, or credit any overpayment, to Account No. 19-0134.

11. PETITION FOR EXTENSION OF TIME

The Notice of Appeal of was received February 15, 2001, and the time for filing the brief was set to expire on April 15, 2001. A three-month extension, to July 15, 2001 is hereby requested pursuant to 37 CFR §1.136(a). Appellants had previously paid for a one-month extension when the brief mailed May 15, 2001 was filed. Please charge Deposit Account No. 19-0134 in the name of Novartis Corporation in the amount of $760 for payment of the three-months' extension fee, which is $870 less the $110 already paid. An additional copy of this paper is here enclosed. The Commissioner is hereby authorized to charge any additional fees under 37 CFR §1.17 that may be required, or credit any overpayment, to Account No. 19-0134 in the name of Novartis Corporation.

Consideration of the issues raised on this Appeal, and reversal of the outstanding rejections is respectfully requested.

An appendix is included which contains a copy of the claims involved in the appeal.

Should the Office feel that telephonic communication with the Appellants' representative would further the prosecution of the instant application, they are invited to telephone the undersigned.

Two additional copies of this sheet are enclosed.

Respectfully submitted,

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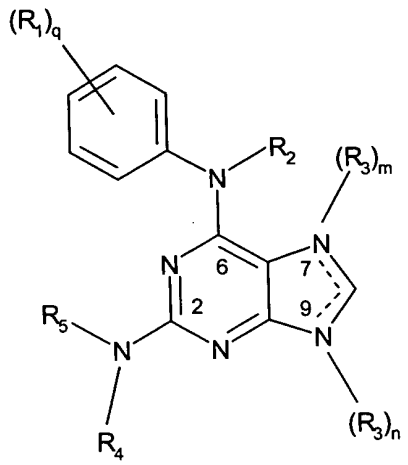
Encl: This sheet in triplicate
This Appeal Brief in Triplicate
Date: July 3, 2001

11. **Appendix A:**

The Appealed Claims:

CLAIMS

Claim 2. A compound of the formula I



(I)

in which q is 1-5,

R_1 is halogen; lower alkyl; hydroxyl; lower alkanoyloxy; lower alkoxy which is unsubstituted or substituted by hydroxyl, lower alkoxy or carboxyl; a radical of the formula $-O(-CH_2-CH_2-O)_t-R_6$, in which t is 2-5 and R_6 is hydrogen or lower alkyl; carboxyl; lower alkoxycarbonyl; piperazin-1-yl-carbonyl; carbamoyl; N-lower alkyl-carbamoyl which is unsubstituted in the lower alkyl moiety or substituted by hydroxyl or amino; N,N-di-lower alkyl-carbamoyl; cyano; nitro; amino; lower alkanoylamino; lower alkylamino; N,N-di-lower alkylamino; aminosulfonyl or trifluoromethyl, where, if more than one radical R_1 is present in the molecule, these can be identical or different from one another,

R_2 is hydrogen, carbamoyl or N-lower alkyl-carbamoyl,

m and n are each 0 or 1, where m is 0 if n is 1 and m is 1 if n is 0,

dashed lines represent a single bond which is located between N-7 and C-8 if m is 0 and located between C-8 and N-9 if m is 1,

R_3 is lower alkyl or phenyl which are unsubstituted or in each case substituted by hydroxyl, lower alkoxy, amino, lower alkylamino or N,N-di-lower alkylamino and

a) R_4 is hydrogen, amino, phenylamino, lower alkylamino, hydroxyl, phenoxy, lower alkoxy; an acyl radical of the part formula Z-C(=W)-, in which W is oxygen, sulfur or imino and Z is R^o, R^o-O- or an amino group of the formula $R_7(R_8)N$-, in which R^o in each case is C_1-C_4alkyl, hydroxy-C_2-C_{14}alkyl, cyano-C_1-C_4alkyl, carboxy-C_1-C_4alkyl, C_1-C_4alkoxycarbonyl-C_1-C_4alkyl, C_3-C_7alkenyl or phenyl and R_7 and R_8 independently of one another are each hydrogen, lower alkyl, ω-amino-lower alkyl, lower alkylsulfonyl or phenyl;

an aliphatic hydrocarbon radical having not more than 29 C atoms, which is substituted by halogen, amino, lower alkylamino, ω-amino-lower alkylamino, lower alkanoylamino, benzoylamino, hydroxylamino, hydroxylimino, lower alkoxy-amino, phenyloxyamino, amino-cyclohexyl-amino-, amino-phenyl-amino-, carbamoyl-amino, (N-lower alkyl-carbamoyl)-amino, (N-[ω-amino-lower alkyl]-carbamoyl)-amino, (N-phenyl-carbamoyl)-amino, mercapto, lower alkylthio, thiocarbamoyl, thioureido, N-lower alkyl-thioureido, N-phenyl-thioureido, guanidino, N-lower alkyl-guanidino, carboxyl, lower alkoxycarbonyl, phenyloxycarbonyl, benzyloxycarbonyl, hydroxylaminocarbonyl, carbamoyl, amidino, cyano, hydroxyl, lower alkoxy, phenyloxy, aminocarbonyl-oxy, oxo, aminosulfonyl, lower alkylsulfonyl-amino, glycylamino, alanylamino, phenylalanylamino, prolylamino, valylamino, leucylamino, isoleucylamino, serylamino, threonylamino, cysteinylamino, methionylamino, tyrosylamino, tryptophanylamino, arginylamino, histidylamino, lysylamino, glutamylamino, glutaminylamino, asparagylamino, asparaginylamino or phenylglycylamino; benzyl;

2-phenyl-ethyl; 3-aminomethyl-benzyl; (1-hydroxy-cyclohex-1-yl)-methyl; (2-amino-3,5,5-trimethyl-cyclopentyl)-methyl; 1-[N-(1-carboxy-2-phenyl-ethyl)-carbamoyl]-2-carbamoyl-eth-1-yl; 1-carbamoyl-1-phenyl-methyl; 1-carbamoyl-2-(4-hydroxy-phenyl)-eth-1-yl; 1-carbamoyl-2-phenyl-eth-1-yl; 2-amino-1,2-diphenyl-eth-1-yl; 2-benzyloxycarbonyl-1-carbamoyl-eth-1-yl; 3-benzyloxycarbonyl-1-carbamoyl-prop-1-yl; 1-adamantyl-2-amino-prop-1-yl; 1-adamantyl-1-amino-prop-2-yl; (2-furyl)-methyl; (2-tetrahydrofuryl)-methyl; 2-pyrid-2-yl-ethyl; 2-piperidino-ethyl; 2-(morpholin-4-yl)-ethyl; 2-(3-indolyl)-ethyl; 2-(4-imidazolyl)-ethyl; 1-carbamoyl-2-(β-indolyl)-eth-1-yl; 1-carbamoyl-2-imidazol-4-yl-eth-1-yl; 1-carbamoyl-2-indol-3-yl-eth-1-yl; 3-aminomethyl-oxetan-3-yl-methyl; 1-(acetoxy-imino)-1-(4-amino-2-oxa-1,3-diazol-5-yl)-methyl; 2-amino-cyclohex-1-yl; 3-amino-cyclohex-1-yl; 2-aminomethyl-3,3,5-trimethyl-cyclopent-1-yl; 3-amino-adamantan-1-yl; 2-carbamoyl-bicyclo[2.2.1]hept-5-en-3-yl; 2-carbamoyl-cyclohex-1-yl; 9-amino-spiro[4.4]non-1-yl; 5-amino-2-oxa-1,3-diazol-4-yl; 4-amino-thien-3-yl; 3-carbamoyl-5-(3-[2,4-dichloro-phenyl]-1-oxo-prop-2-en-1-yl)-1,2-thiazol-4-yl; 3-carbamoyl-5-(3-[4-trifluoro-phenyl]-1-oxo-prop-2-en-1-yl)-1,2-thiazol-4-yl; 4-amino-2-(4-carboxy-butyl)-tetrahydrothiophen-3-yl; 3-amino-2-(4-carboxy-butyl)-tetrahydrothiophen-4-yl; [1,2,5]oxadiazolo[3,4-b](6-amino-pyrazin-5-yl); 2,5'-diacetyl-3-amino-thieno[2,3-b]thiophen-4'-yl or 3-amino-2,5'-dipivaloyl-thieno[2,3-b]thiophen-4'-yl, and

R_5 independently of R_4, is as defined above for R_4, with the exception of hydrogen and an aliphatic hydrocarbon radical having not more than 29C atoms, which is substituted by hydroxyl, or

b) R_4 and R_5 together are 1,2-ethylene, propane-1,3-diyl, butane-1,4-diyl, pentane-1,5-diyl, 3-(3-amino-propionyl)-3-aza-pentane-1,5-diyl, 1-aminomethyl-butane-1,4-diyl, 1-hydroxy-

methyl-butane-1,4-diyl, 3-(2-amino-ethyl)-pentane-1,5-diyl, 3-aza-pentane-1,5-diyl or 3-(2-amino-ethyl)-3-aza-pentane-1,5-diyl,

or a salt thereof.

Claim 3. A compound of the formula I according to Claim 2, in which

q is 1-3 and

R_4 is hydrogen,

or a salt thereof.

Claim 4. A compound of the formula I according to claim 2, in which

q is 1,

R_1 is chlorine which is in the 3 position,

R_2 is hydrogen,

m is 0 and

n is 1,

R_3 is ethyl and

a) R_4 is hydrogen, and

R_5 is amino; phenylamino; lower alkylamino; hydroxyl; phenoxy; loweralkoxy; an acyl radical of the part formula Z-C(=W)-, in which W is oxygen, sulfur or imino and Z is R^o, R^o-O- or an amino group of the formula $R_7(R_8)N$-, in which R^o in each case is C_1-C_4alkyl, hydroxylC_2-C_{14}alkyl, cyano-C_1-C_4alkyl, carboxy-C_1-C_4alkyl, C_1-C_4alkoxycarbonyl-C_1-C_4alkyl, C_3-C_7alkenyl or phenyl and R_7 and R_8 independently of one another are each hydrogen, lower alkyl, ω-amino-lower alkyl, lower alkylsulfonyl or phenyl;

2-carbamoyl-1-carboxy-eth-1-yl, 3-amino-2-hydroxy-prop-1-yl, 3-amino-prop-1-yl, 3-amino-2,2-dimethyl-prop-1-yl, 3-amino-2-oxo-prop-1-yl, 3-amino-1-carboxy-prop-1-yl, 3-amino-3-carboxy-prop-1-yl, 1,1-dicarbamoyl-methyl, 2-carbamoyl-eth-1-yl, 3-amino-1,3-di-hydroxyl-imino-prop-1-yl, 2-carbamoyl-1-hydroxylimino-eth-1-yl, 1-hydroxylimino-2-thiocarbamoyl-eth-1-yl, 3-amino-3-hydroxylimino-1-thio-prop-1-yl, 3-amino-pent-1-yl,1-amino-pent-3-yl,1-amidino-1-carbamoyl-methyl, 4-amino-1,1,1,3,5,5,5-heptafluoro-pent-2-yl, 3-amino-1,3-dicarboxy-prop-1-yl, 2-carbamoyl-1-ethoxycarbonyl-eth-1-yl, 2-amino-1,2-dithio-eth-1-yl, 2-amino-1,2-dioxo-eth-1-yl, 2-amino-2-methyl-prop-1-yl, 1-amino-2-methyl-prop-2-yl, 2-amino-prop-1-yl, 1-amino-prop-2-yl, 2-amino-eth-1-yl, 2-amino-2-carboxy-eth-1-yl, 2-amino-1-carboxy-eth-1-yl, carbamoyl-methyl, 1-carbamoyl-3-methyl-but-1-yl, 2-amino-1,2-dicarboxy-eth-1-yl, 1-carbamoyl-3-methylthio-prop-1-yl, 1-carbamoyl-2-methyl-prop-1-yl,1-carbamoyl-eth-1-yl, 1-carbamoyl-1-cyano-methyl, 1-carbamoyl-3-carboxy-3-fluoro-prop-1-yl, 1-carbamoyl-2-carboxy-eth-1-yl, 2-amino-4-carboxy-but-1-yl, 1-amino-4-carboxy-but-2-yl, 1-carbamoyl-4-guanidino-but-1-yl, 1-carbamoyl-5-amino-pent-1-yl, 1-carbamoyl-2-hydroxy-prop-1-yl, 1-carbamoyl-2-methyl-but-1-yl, 1-carbamoyl-2-hydroxy-eth-1-yl, 1,3-dicarbamoyl-prop-1-yl, 2-amino-but-1-yl, 1-amino-but-2-yl, 1-carbamoyl-pent-1-yl, 1-carbamoyl-but-1-y, benzyl, 2-phenyl-ethyl, 3-aminomentyl-benzyl, (1-hydroxy-cyclohex-1-yl-methyl, (2-amino-3,5,5-trimethyl-cyclopentyl)-methyl, 1-[N-(1-carboxy-2-phenyl-ethyl)-carbamoyl]-2-carbamoyl-eth-1-yl, 1-carbamoyl-1-phenyl-methyl, 1-carbamoyl-2-(4-hydroxy-phenyl)-eth-1-yl, 1-carbamoyl-2-phenyl-eth-1-yl, 2-amino-1,2-diphenyl-eth-1-yl, 2-benzyloxycarbonyl-1-carbamoyl-eth-1-yl, 3-benzyloxycarbonyl-1-carbamoyl-prop-1-yl, 1-adamantyl-2-amino-prop-1-yl, 1-adamantyl-1-amino-prop-2-yl, (2-furyl)-methyl, (2-tetrahydrofuryl)-methyl, 2-pyrid-2-yl-ethyl, 2-piperidino-ethyl, 2-(morpholin-4-yl)-ethyl, 2-(3-indolyl)-ethyl, 2-(4-imidazolyl)-ethyl, 1-carbamoyl-2-(β-indolyl)-

eth-1-yl, 1-carbamoyl-2-imidazol-4-yl-eth-1-yl, 1-carbamoyl-2-indol-3-yl-eth-1-yl, 3-aminomethyl-oxetan-3-yl-methyl, 1-(acetoxy-imino)-1-(4-amino-2-oxa-1,3-diazol-5-yl)-methyl, 2-amino-cyclohex-1-yl, 3-amino-cyclohex-1-yl, 2-aminomethyl-3,3,5-trimethyl-cyclopent-1-yl, 3-amino-adamantan-1-yl, 2-carbamoyl-bicyclo[2.2.1]hept-5-en-3-yl, 2-carbamoyl-cyclohex-1-yl, 9-amino-spiro-[4.4]non-1-yl,

5-amino-2-oxa-1,3-diazol-4-yl, 4-amino-thien-3-yl, 3-carbamoyl-5-(3-[2,4-dichloro-phenyl]-1-oxo-prop-2-en-1-yl)-1,2-thiazol-4-yl, 3-carbamoyl-5-(3-[4-trifluoro-phenyl]-1-oxo-prop-2-en-1-yl)-1,2-thiazol-4-yl, 4-amino-2-(4-carboxy-butyl)-tetrahydrothiophen-3-yl, 3-amino-2-(4-carboxy-butyl)-tetrahydrothiophen-4-yl, [1,2,5]oxadiazolo[3,4-b](6-amino-pyrazin-5-yl), 2,5'-diacetyl-3-amino-thieno[2,3-b]thiophen-4'-yl or 3-amino-2,5'-dipivaloyl-thieno[2,3-b]thiophen-4'-yl, or

b) R_4 and R_5 together are 1,2-ethylene, propane-1,3-diyl, butane-1,4-diyl, pentane-1,5-diyl, 3-(3-amino-propionyl)-3-aza-pentane-1,5-diyl, 1-aminomethyl-butane-1,4-diyl, 1-hydroxy-methyl-butane-1,4-diyl, 3-(2-amino-ethyl)-pentane-1,5-diyl, 3-aza-pentane-1,5-diyl or 3-(2-amino-ethyl)-3-aza-pentane-1,5-diyl,

or a salt thereof.

Claim 6. A compound of the formula I according to claim 2, in which

q is 1-3,

R_1 is halogen; lower alkyl; lower alkoxy; N-lower alkyl-carbamoyl which is substituted in the lower alkyl moiety by hydroxyl; or trifluoromethyl, where, if more than one radical R_1 is present in the molecule, these can be identical or different from one another,

R_2 is hydrogen,

m and n are each 0 or 1, where m is 0 if n is 1 and m is 1 if n is 0,

dashed lines represent a single bond which is located between N-7 and C-8 if m is 0 and located between C-8 and N-9 if m is 1,

R_3 is lower alkyl which is unsubstituted or substituted by hydroxyl and

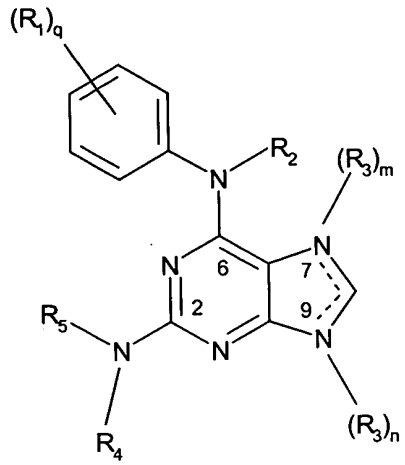
a) R_4 is hydrogen or hydroxy-lower alkyl and

R_5 is 2-amino-cyclohexyl; or lower alkyl which is substituted by amino, lower alkylamino, ω-amino-lower alkylamino, lower alkoxy, phenyl, 3-aminomethyl-phenyl, 2-furyl, 2-tetrahydrofuryl, 2-pyridyl, piperidino, morpholin-4-yl, 3-indolyl, mercapto, 1-hydroxy-cyclohex-1-yl or by 4-imidazolyl; or

b) R_4 and R_5 together are an alkylene radical which has not more than 10 C atoms and is unsubstituted or substituted by hydroxyl or amino, and in which 1 C atom can be replaced by nitrogen,

or a pharmaceutically acceptable salt thereof.

Claim 14. A process for the preparation of a compound of the formula I



(I)

in which q is 1-5,

R_1 is halogen, lower alkyl, hydroxyl or lower alkanoyloxy; lower alkoxy which is unsubstituted or substituted by hydroxyl, lower alkoxy or carboxyl; a radical of the formula $-O(-CH_2-CH_2-O)_t-R_6$, in which t is 2-5 and R_6 is hydrogen or lower alkyl; carboxyl, lower alkoxycarbonyl, piperazin-1-yl-carbonyl or carbamoyl; N-lower alkyl-carbamoyl which is unsubstituted in the lower alkyl moiety or substituted by hydroxyl or amino; N,N-di lower alkyl-carbamoyl, cyano, nitro, amino, lower alkanoylamino, lower alkylamino, N,N-di-lower alkylamino, aminosulfonyl or trifluoromethyl, where, if several radicals R_1 are present in the molecule, these can be identical or different,

R_2 is hydrogen, carbamoyl or N-lower alkyl-carbamoyl,

m and n are each 0 or 1, where m is 0 if n is 1 and m is 1 if n is 0,

R_3 is lower alkyl or phenyl which are unsubstituted or in each case substituted by hydroxyl, lower alkoxy, amino, lower alkylamino or N,N-di-lower alkylamino and

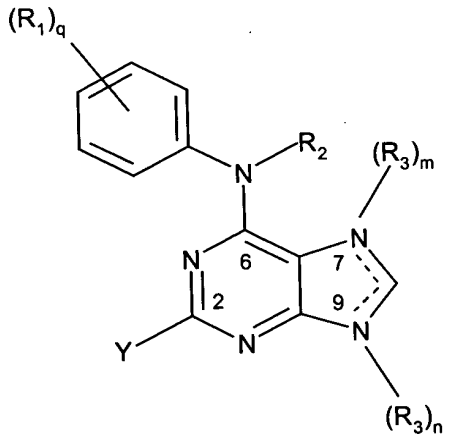
a) R_4 is hydrogen, amino, phenylamino, lower alkylamino, hydroxyl, phenoxy, lower alkoxy, acyl having 1-30 C atoms, a substituted aliphatic hydrocarbon radical having not more than 29 C atoms, a carbocyclic radical having not more than 29 C atoms or a heterocyclic radical having not more than 20 C atoms and not more than 9 heteroatoms and

R_5 is amino, phenylamino, lower alkylamino, hydroxyl, phenoxy, lower alkoxy, acyl having 2-30 C atoms, a substituted aliphatic hydrocarbon radical having not more than 29 C atoms, a carbocyclic radical having not more than 29 C atoms or a heterocyclic radical having not more than 20 C atoms and not more than 9 heteroatoms, or

b) R_4 and R_5 together are a substituted or unsubstituted alkylene or alkenylene radical having in each case not more than 15 C atoms, in which 1-3 C atoms can be replaced by oxygen, sulfur or nitrogen,

R_1, R_2, m, n, R_3, R_4 and R_5 are as defined in Claim 20, which comprises

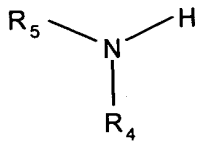
a) reacting a compound of the formula II



(II)

in which Y is a suitable leaving group and the other substituents and symbols are as defined above for compounds of the formula I, free functional groups present therein, if

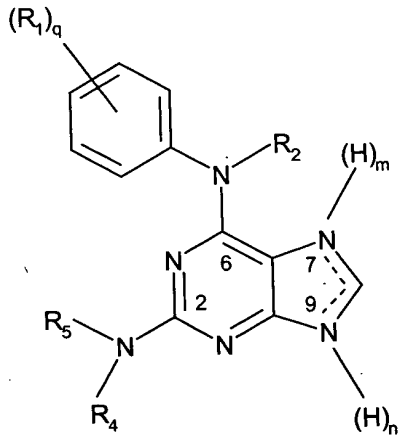
necessary, being protected by easily detachable protective groups, with an amine of the formula III



(III)

in which the substituents are as defined above for compounds of the formula I, free functional groups present therein, if necessary, being protected by easily detachable protective groups and detaching the protective groups present, or

b) reacting a compound of the formula V



(V)

in which the substituents and symbols are as defined above for compounds of the formula I, free functional groups present therein, if necessary, being protected by easily detachable protective groups,

with a compound of the formula VI

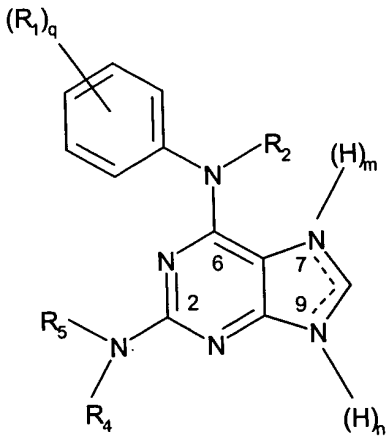
$$R_3\text{-}Y \qquad (VI)$$

in which Y is a suitable leaving group and

R_3 is as defined above for compounds of the formula I, free functional groups present in R_3, if necessary, being protected by easily detachable protective groups, and detaching the protective groups present,

and, after carrying out process a) or b), if necessary for the preparation of a salt, converting a resulting free compound of the formula I into a salt or, if necessary for the preparation of a free compound, converting a resulting salt of a compound of the formula I into the free compound.

Claim 16. A compound of the formula V



(V)

in which q is 1 to 5,

R_1 is halogen; lower alkyl; hydroxyl; lower alkanoyloxy; lower alkoxy which is unsubstituted or substituted by hydroxyl, lower alkoxy or carboxyl; a radical of the formula $-O(-CH_2-CH_2-O)_t-R_6$, in which t is 2-5 and R_6 is hydrogen or lower alkyl; carboxyl; lower alkoxycarbonyl; piperazin-1-yl-carbonyl; carbamoyl; N-lower alkyl-carbamoyl which is unsubstituted in the lower alkyl moiety or substituted by hydroxyl or amino; N,N-di-lower alkyl-carbamoyl; cyano; nitro; amino; lower alkanoylamino; lower alkylamino; N,N-di-lower alkylamino; aminosulfonyl or trifluoromethyl, where, if more than one radical R_1 is present in the molecule, these can be identical or different from one another,

R_2 is hydrogen, carbamoyl or N-lower alkyl-carbamoyl,

m and n are each 0 or 1, where m is 0 if n is 1 and m is 1 if n is 0,

dashed lines represent a single bond which is located between N-7 and C-8 if m is 0 and located between C-8 and N-9 if m is 1, and

a) R_4 is hydrogen; amino; phenylamino; lower alkylamino; hydroxyl; phenoxy; lower alkoxy; an acyl radical of the part formula Z-C(=W)-, in which W is oxygen, sulfur or imino and Z is R^o, R^o-O- or an amino group of the formula $R_7(R_8)N$-, in which R^o in each case is C_1-C_4alkyl, hydroxy-C_2-C_{14}alkyl, cyano-C_1-C_4alkyl, carboxy-C_1-C_4alkyl, C_1-C_4alkoxycarbonyl-C_1-C_4alkyl, C_3-C_7alkenyl or phenyl and R_7 and R_8 independently of one another are each hydrogen, lower alkyl, ω-amino-lower alkyl, lower alkylsulfonyl or phenyl;

an aliphatic hydrocarbon radical having not more than 29 C atoms, which is substituted by halogen, amino, lower alkylamino, ω-amino-lower alkylamino, lower alkanoylamino, benzoylamino, hydroxylamino, hydroxylimino, lower alkoxy-amino, phenyloxyamino, amino-cyclohexyl-amino-, amino-phenyl-amino-, carbamoyl-amino, (N-lower alkyl-carbamoyl)-amino, (N-[ω-amino-lower alkyl]-carbamoyl)-amino, (N-phenyl-carbamoyl)-amino, mercapto, lower alkylthio, thiocarbamoyl, thioureido, N-lower alkyl-thioureido, N-phenyl-

thioureido, guanidino, N-lower alkyl-guanidino, carboxyl, lower alkoxycarbonyl, phenyloxycarbonyl, benzyloxycarbonyl, hydroxylaminocarbonyl, carbamoyl, amidino, cyano, hydroxyl, lower alkoxy, phenyloxy, aminocarbonyl-oxy, oxo, aminosulfonyl, lower alkysulfonyl-amino, glycylamino, alanyl-amino, phenylalanylamino, prolylamino, valylamino, leucylamino, isoleucylamino, serylamino, threonylamino, cysteinylamino, methionylamino, tyrosylamino, tryptophanylamino, arginylamino, histidylamino, lysylamino, glutamylamino, glutaminylamino, asparagylamino, asparaginylamino or phenylglycylamino;

benzyl; 2-phenyl-ethyl; 3-aminomethyl-benzyl; (1-hydroxy-cyclohex-1-yl)-methyl; (2-amino-3,5,5-trimethyl-cyclopentyl)-methyl; 1-[N-(1-carboxy-2-phenyl-ethyl)-carbamoyl]-2-carbamoyl-eth-1-yl; 1-carbamoyl-1-phenyl-methyl; 1-carbamoyl-2-(4-hydroxyl-phenyl)-eth-1-yl; 1-carbamoyl-2-phenyl-eth-1-yl; 2-amino-1,2-diphenyl-eth-1-yl; 2-benzyloxycarbonyl-1-carbamoyl-eth-1-yl; 3-benzyloxycarbonyl-1-carbamoyl-prop-1-yl; 1-adamantyl-2-amino-prop-1-yl; 1-adamantyl-1-amino-prop-2-yl; (2-furyl)-methyl; (2-tetrahydrofuryl)-methyl; 2-pyrid-2-yl-ethyl; 2-piperidino-ethyl;

2-(morpholin-4-yl)-ethyl; 2-(3-indolyl)-ethyl; 2-(4-imidazolyl)-ethyl; 1-carbamoyl-2-(β-indolyl)-eth-1-yl; 1-carbamoyl-2-imidazol-4-yl-eth-1-yl; 1-carbamoyl-2-indol-3-yl-eth-1-yl; 3-amino-methyl-oxetan-3-yl-methyl; 1-(acetoxy-imino)-1-(4-amino-2-oxa-1,3-diazol-5-yl)-methyl; 2-amino-cyclohex-1-yl; 3-amino-cyclohex-1-yl; 2-aminomethyl-3,3,5-tirmethyl-cyclopent-1-yl; 3-amino-adamantan-1-yl; 2-carbamoyl-bicyclo[2.2.1]hept-5-en-3-yl; 2-carbamoyl-cyclohex-1-yl; 9-amino-spiro[4.4]non-1-yl;

5-amino-2-oxa-1,3-diazol-4-yl; 4-amino-thien-3-yl; 3-carbamoyl-5-(3-[2,4-dichloro-phenyl]-1-oxo-prop-2-en-1-yl)-1,2-thiazol-4-yl; 3-carbamoyl-5-(3,-[4-trifluoro-phenyl]-1-oxo-prop-2-en-1-yl)-1,2-thiazol-4-yl; 4-amino-2-(4-carboxy-butyl)-tetrahydrothiophen-3-yl; 3-amino-2-(4-carboxy-butyl)-tetrahydrothiophen-4-yl; [1,2,5]oxadiazolo[3,4-b](6-amino-pyrazin-5-yl); 2,5'-

diacetyl-3-amino-thieno[2,3-b]thiophen-4'-yl or 3-amino-2,5'-dipivaloyl-thieno[2,3-b]thiophen-4'-yl, and

R_5, independently of R_4, is as defined above for R_4, with the exception of hydrogen and an aliphatic hydrocarbon radical having not more than 29 C atoms, which is substituted by hydroxyl, or

b) R_4 and R_5 together are 1,2-ethylene, propane-1,3-diyl, butane-1,4-diyl, pentane-1,5-diyl, 3-(3-amino-propionyl)-3-aza-pentane-1,5-diyl, 1-aminomethyl-butane-1,4-diyl, 1-hydroxy-methyl-butane-1,4-diyl, 3-(2-amino-ethyl)-pentane-1,5-diyl, 3-aza-pentane-1,5-diyl or 3-(2-amino-ethyl)-3-aza-pentane-1,5-diyl, it being possible for free functional groups present therein to be protected by easily detachable protective groups.

Claim 17. A compound of the formula I according to claim 2 selected from the group consisting of

6-(4-benzyloxycarbonylamino-phenyl-amino)-9-ethyl-2-(2-hydroxy-ethyl-amino)-*9H*-purine,

6-(4-fluoro-phenyl-amino)-9-ethyl-2-(*trans*-4-hydroxy-cyclohexyl-amino)-*9H*-purine,

9-ethyl-2-(*trans*-4-hydroxy-cyclohexyl-amino)-6-(4-trifluoromethyl-phenyl-amino)-*9H*-purine,

2-(*trans*-4-amino-cyclohexyl-amino)-9-ethyl-6-(4-trifluoromethyl-phenyl-amino)-*9H*-purine,

6-(3-fluoro-phenyl-amino)-9-ethyl-2-(*trans*-4-hydroxy-cyclohexyl-amino)-*9H*-purine,

6-(3-cyano-phenyl-amino)-9-ethyl-2-(*trans*-4-hydroxy-cyclohexyl-amino)-*9H*-purine,

2-(*cis*-3-amino-cyclohexyl-amino)-6-(3-chloro-phenyl-amino)-9-ethyl-*9H*-purine, and

6-(4-fluoro-phenyl-amino)-2-(2-hydroxy-ethyl-amino)-9-isopropyl-*9H*-purine

or a pharmaceutically acceptable salt of such a compound.

Claim 18. A pharmaceutical composition comprising a pharmaceutically acceptable carrier or diluent and a therapeutically effective amount of a compound of the formula I according to claim 2, or a pharmaceutically acceptable salt thereof.

Claim 19. A method of treating tumors which are responsive to the inhibition of $p34^{cdc2}$/cyclin B^{cdc13} kinase, comprising administering to a subject in need of such treatment a therapeutically effective amount of a compound of formula I according to claim 2, or a pharmaceutically acceptable salt thereof.